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A Process to Seal the Sole Area of Shoes

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A PROCESS TO SEAL THE SOLE AREA OF SHOES

The invention relates to a process for waterproof sealing of the outsole end area of a waterproof shoe leg of a shoe with an adhesively bonded outsole by injection of a waterproof sealing material which can be liquefied and becomes waterproof when hardened.

The sealing of the outsole end area of the shoe leg is particularly problematic for waterproof shoes. This applies in particular to waterproof and breathable shoes the legs of which are provided with an air permeable upper material, e.g. a textile or leather and a lining with a waterproof and water vapor permeable and thus breathable functional layer.

Conventional lasting processes, wherein an insole is mounted to a last and an outsole end area of the shoe leg is turned over a circumferential edge area of the insole and attached to the insole, required numerous production steps and cause problems when the last area is to be sealed. To make such lasted shoes, first the circumferential edge of the insole is covered with glue. The lasting is then effected in three zones and phases. At first the shoe tip, then the side area and finally the heel area is glued. After each gluing process time must elapse before the adhesive has reached a sufficient sticking effect. After the three gluing phases, the adhesive is reactivated and thus softened in order to balance the transitions between the individual adhesive zones. This is intended to prevent residual spots of insufficient glue through which water could penetrate.

As it is the case with other production processes, the lasting process is susceptible to the formation of water bridges at the outsole where the lining has a transition to the upper material. Since in wrinkles caused by lasting there are often adhesive gaps through which water can penetrate, a glue layer is applied over the full surface in order to securely seal such wrinkles.

A four-layer laminate is used as a waterproof, breathable lining. This laminate comprises a lining, a foam-like plastic, a functional layer - preferably a membrane of expanded, microporous polytetrafluoroethylene (PTFE) and a backing fabric in form of a textile reinforcement of the functinal layer. In order to waterproofly bond the functional layer with the adhesive to the insole, the functional layer is laid open by a process known as skiving. During this process the lining and the foam are removed. The foam affords a certain tolerance so that the lining can be removed from the functional layer without damaging it. It is only to allow for such a destruction-free stripping process that the entire lining laminate is provided with a foam layer.

The necessity to provide the entire lining with a foam layer makes the lining laminate more expensive. Applying the glue, lasting zone by zone and covering the whole surface by glue to make the construction tight requires expensive manual work and long standstill times on the lasts. Therefore these process steps cause considerable production costs and the production throughput is so low that the number of shoes produced per

unit of time does not fit into a mass production concept.

Such problems have been overcome by a process described in DE 37 12 901 C1 wherein a molding form is applied to the underside of the shoe leg which has been lasted to the circumference of the insole. Said mold comprises a sealing lip arrangement which protrudes towards the lasted leg area and which is shaped like the circumference of the insole. Through this injection mold liquid sealing material which hardens later is injected into the area limited by the sealing lip arrangement. During the lasting process an inner edge area of the lasted area is kept free from adhesive. The sealing material can thus seal this inner edge area of the lasted area when injected through the mold.

This known injection molding process has proven to be a suitable technology and is highly reliable when it comes to producing waterproof shoes. However, the shoe manufacturer must make cost-intensive investments because he must buy a suitable injection machine.

The present invention creates a process by means of which such a sealing process can be effected much simpler and less expensively by using a sealing mass.

In a process of the type described above it works as follows: The outsole and/or the insole is provided with an injection opening at least at one spot within the area limited by the outsole end area of the leg and the sealing material is injected through at last one injection opening between the outsole and the insole and is pressed up to the outsole end eare of the leg by the injection pressure or by a pressure applied after injection.

All that needs to be done to use this process is to provide the outsole and/or the insole with a hole for injection. For the injection process itself a conventional syringe suffices, e.g. the type used to seal grooves in the bathroom. In series shoe production this process can be automated without problems. Since the sealing mass solves the sealing problem, the lasting process becomes less work-intensive than in the conventional process. Therefore the invention considerably reduces costs and the shoe production process can be automated either fully or to a large extent.

The outsole is bonded to the leg preferably only in a circumferential area in such a way that the outsole end area of the leg is not bonded to the outsole. This closes the wirnkles formed during lasting. On the other hand this causes sealing material to enter the upper material of the leg and eliminates the water conductivity in this leg area. When the injection opening is closed with a plug immediately after the injection process it is particularly advisable to use a non-degassing material as sealing mass. Suitable sealing materials are silocone, silicone caoutchouc, acrylate, polyurethane and polycarboxylic acid.

It is particularly advisable to make the outsole and/or the insole thicker towards the insole and/or the outsole within the inner edge area of the lasted area. In this way the

interstice between insole and outsole needs to be filled with a smaller quantity of the relatively expensive sealing material. This is feasible because the desired effect does not depend on a large quantity of sealing material entering the interstice between insole and outsole but only on the fact that the sealing material reaches the lasted area.

The process of the invention is not only suitable for shoes produced in a lasting process. It is suitable wherever the sealing between the upper material and the lining on the one hand and between the lining and the insole in the area connecting the leg and the insole needs to be particularly good.

When the lasting process is used it is particularly advantageous to cut the lining at the end facing the outsole to such a length that it is at least as long as the upper material or has an edge protruding over the upper material, preferably in a range of about 3 mm. It is also possible to not adhesively bond the upper material and the lining in their end areas facing the outsole so that the sealing material can enter these end areas between the upper material and the lining during the injection process.

In a particularly preferred embodiment of the process of the invention the following process steps ensue:

On the one hand an insole is mounted to a last. On the other hand the upper material and lining are sewn together at the upper leg end. On their outsole ends the upper material and the lining are cut to the same length or with a protruding edge of the lining over the upper material of preferably approximately 3 mm. In the lasted area, the upper material and the lining are adhesively bonded to each other. The lasted area of the upper material and the lining bonded thereto are lasted to the insole. The outsole, which is provided with an injection opening, is adhesively bonded to the outsole end of the leg, with the exception of a free lasted end area measuring about 0.5 cm . The sealing material is then injected between the insole and the outsole through the injection opening. The injection opening can then be closed by a plug.

Furthermore, the invention provides for a waterproof shoe with a waterproof leg, an insole, a waterproof outsole and a sealing material injected between the insole and the outsole in order to seal the outsole end area of the leg in a waterproof way. Said waterproof shoe is characterized in that the leg is bonded to the outsole in such a way that an end area of the leg is free from the adhesive which is used on the outsole and that the outsole and/or the insole is provided with at least one injection opening for injecting the sealing material.

US-A-2 607 061 states a process wherein an insole opening is used to inject a curable material in that an adhesive is injected through the insole opening into an axial middle channel of a high heel in order to stick the heel to the shoe.

In the following, the invention will be explained in further detail with reference to some embodiments. The Figures:

Fig. 1 a longitudinal section through a shoe of the invention

Fig. 2 a top view from the bottom onto an insole and a lasted area of a leg comprising an upper material and a lining laminate and

Fig. 3 a longitudinal section through a shoe according to a modified embodiment of the invention.

Fig. 1 is a cross sectional view of a first embodiment of a shoe 11 of the invention, which incorporates a leg 13, an insole 15, an outsole 17 with an injection opening 19 and a sealing material between the insole 15 and the outsole 17. The leg 13 comprises an upper material 23 and a lining laminate 25. The lining laminate 25 is provided with a waterproof, water-vapor permeable functional layer, preferably of expanded microporous PTFE on the side , a backing fabric consisting of a textile reinforcement material on the side facing the upper material 13 and a lining layer on the opposite side. The individual layers of the lining laminate 25 are not shown in the drawings. In the toe area and the heel area of the shoe 11 there is a front cap 27 and a heel cap 29 consisting of a material which reinforces the shoe between the upper material 23 and the lining laminate 25 .

Fig. 1 shows a shoe which has been produced in a lasting process. For this purpose a lasted area 31 of the leg 13 on the outsole is turned around a circumferential area of the insole or lasted to this area and bonded to the circumferential area 33 of the insole by a lasting adhesive 35. At the free end of the lasted area 31 the upper material 23 and the lining laminate are either cut to the same length, as shown in the front cap area of the shoe, or the lining laminate is cut such that it protrudes by about 3 mm above the upper material, as shown in Fig. 1 for the heel cap area.

The outsole 17 is bonded to the outsole end area of the leg 13 in such a way that an end ara 37 of the lasted area 31 remains free from the adhesive 41 which is used to glue the outsole 17. The adhesive 41 is symbolized by little crosses in the outsole area in Fig. 1. In reality the adhesive 41 is of course located between the outsole 17 and the leg 13. The sealing material 21 fills in a space 39 an interstice between the center area of the outsole 17 which is not glued to the leg 13 and the center area of the insole 15 which is not covered by the lasted area.

Such a shoe is produced according to an embodiment of the invention as follows:

The upper material 23 and the lining laminate 25 are sewn together in the upper end area of the leg 13 facing away from the outsole 17. On the end of the leg 13 which faces the outsole the lining laminate 25 is cut to the same length as the upper material 23 or is cut such that it protrudes by about 3 mm above the upper material 23. The lining laminate 25

is glued to the upper material over a width of about 2 cm on the lasted area or lasted edge, while the inner end area of the lasted area may remain unglued. An insole made of leather or a leather-like material made of man-made fibers or cotton is attached to a last. Then the entire outsole end area of the leg 13 is turned around the last and lasted to the insole 15 by means of a conventional lasting adhesive 35. Instead of an adhesive lasting process a lasting process may be used wherein the leg is nailed to the insole, at least in the heel area.

After the leg 13 has been lasted the upper material 23 is roughened in the area of the lasted edge and wrinkles in the lasted area 31, if any, are egalized by grinding, in particular in the tip and heel area. The lasted area is then covered by a conventional sole adhesive 41, depending on the material of the outsole, in such a way that about 0.5 cm of the end area of the lasted area 31 are free from sole adhesive 41. Furthermore, the sole adhesive 41 is applied to a sufficiently wide edge area of the outsole 17. The space 39 located within the inner edge of the lasted area 31 remains unglued.

The outsole has a hole which measures about 3 mm and which serves as an injection opening in the area of the joint, i.e. between the treading area of the forefoot and the heel. Through this injection opening 19 the sealing material 21 is injected when the shoe 11 is ready. It fills the intersole space 39. Subsequently the injection opening 19 is sealed, e.g. by a plug (not shown). The shoe then comes to a press where the sealing mass is pressed into all existing wrinkles and channels of the lasted area 31 in the non-glued part of the lasted area 31 and partially into the structure of the upper material to seal these areas. A conventional sole press, e.g. a Funck-press with inflatable pressure pad, is suitable. Depending on the type of shoe and sole, pressures of up to 50 atü are preferable.

Fig. 2 shows an embodiment wherein the lining laminate 25 projects over the upper material 23 in the lasted area 31.

Fig. 3 shows an embodiment which equals the one shown in Fig. 1 with the exception that the insole 15 is provided with a higher part 45 in the space towards the outsole 17, so that the part of the space 39 which is to be filled by the sealing material becomes smaller. This saves sealing material.

The process of the present invention has the following special benefits:

- simple, automated production process
- production process suitable for mass production conditions
- the shoe manufacturer does not need to make big investments
- no reduction of production capacity because the process is not time-intensive
- less expensive than existing processes
- shock absorption effect in the whole sole area because the intersole space is filled with the sealing material
- the process may be used for ready-made soles of all types and thicknesses

Patent Claims

1.
A process to seal the outsole end area of a waterproof shoe leg (13) of a shoe (11) with glued outsole (17) in a waterproof way by injecting a liquefyable sealing material (21) which becomes waterproof when hardened,
characterized in that
- the outsole (17) and/or the insole (15) is provided with an injection opening (19) at least at one spot lying within the end area of the leg (13),
- and that the sealing material (21) is injected through at least one injection opening (19) between the insole (15) and the outsole (17) and is pressed up to the outsole end area of the leg (13) by the injection pressure or by pressure applied after injection.

2.
A process of Claim 1,
characterized in that
the outsole (17) is bonded to the leg (13) only in a circumferential area, in such a way that the outsole end area of the leg (13) remains such that it is not glued to the outsole (17).

3.
A process of Claim 1 or 2,
characterized in that
the insole (15) is bonded to the leg (13) only in a circumferential area and in such a way that the outsole end area of the leg (13) remains such that it is not bonded to the insole (15).

4.
A process of Claim 1 to 3,
characterized in that
a material is injected which does not degas while curing.

5.
A process of Claim 1 to 4,
characterized in that
the sealing material (21) is selected from the material group silocone, silicone caoutchouc, acrylate, polyurethane and a copolymerisate in the form of polycarboxylic acid.

6.
A process of one of Claims 1 to 5,
characterized in that
each injection opening (19) is closed by a plug after the sealing material (21) has been injected.

7.
A process of one of Claims 1 to 6,
characterized in that
the outsole (17) and/or the insole (15) has a thicker area (45) in a central area within the lasting area (31) towards the insole (15) and/or towards the outsole (17) such that the interstice (39) between the insole (15) and the outsole (17) which is to be filled with the sealing material (21) becomes smaller.

8.
A process of one of Claims 1 to 7,
characterized in that
the shoe leg (13) consists of an upper material (23) which is air and waterproof and a lining (25) with a waterproof, water vapor permeable functional layer,
and that the lining (25) is cut to the same length as the upper material (23) or is cut such that it protrudes over the upper material (23).

9.
A process of Claim 8,
characterized in that
the upper material (23) and the lining (25) are not connected in their outsole end areas so that the sealing material (21) can penetrate into these end areas between the upper material (23) and the lining (25).

10.
A process of Claim 8,
characterized by the following process steps:

(a) an insole (15) is mounted to a last;

(b) the upper material (23) and the lining (25) are sewn together at the upper leg end;

(c) the upper material (23) and the lining (25) are cut to the same length at their outsole ends or are cut such that the lining (25) protrudes over the upper material (23) by about 3 mm;

(d) the upper material (23) and the lining (25) are glued together in the lasted area;

(e) the lasted area of the upper material (23) and the lining (25) bonded thereto are lasted to the insole (15);

(f) the outsole (17) is provided with an injection opening (19);

(g) the outsole (17) is bonded to the outsole end of the leg (13) with the exception of the free end of the lasted area (31);

(h) the sealing material (21) is injected through the injection opening (19) into the area between the insole (15) and the outsole (17).

11.
A waterproof shoe with a waterproof leg (13), an insole (15), a waterproof outsole (17) and a sealing material (21) injected between the insole (15) and the outsole (17) to seal and make waterproof the outsole end area of the leg (13),
characterized in that
the leg (13) is bonded to the outsole (17) in such a way that an outsole end area of the leg (13) is free from the adhesive used to glue the outsole (17) and that the outsole (17) and/or the insole (15) is provided with at least one injection

opening (19) for injecting the sealing material (21).

12.
A waterproof shoe of Claim 11
characterized in that
the insole (15) and/or the outsole (17) has a thicker part (45) in a center area (39) within the circumference of the insole towards the outsole (17) or the insole (15) in order to reduce the volume between insole (15) and outsole (17) to be filled by the sealing material (21).

ABSTRACT

A process which serves to seal and make waterproof the outsole end area of a waterproof shoe leg (13) of a shoe (11) with a glued outsole (17) by injecting a sealing material (21) which can be liquefied and which becomes waterproof when cured. The outsole (17) is provided with an injection opening for injecting the sealing material (21). The outsole (17) is glued to the leg (13) only in a circumferential area and in such a way that the outsole end area of the leg (13) remains unglued. The sealing material (21) is injected through the injection opening (19) between the insole (15) and the outsole (17) and is pressed up to the outsole end area of the leg (13) by the injection pressure or by pressure applied after injection.

(Fig. 1)

FIG. 1

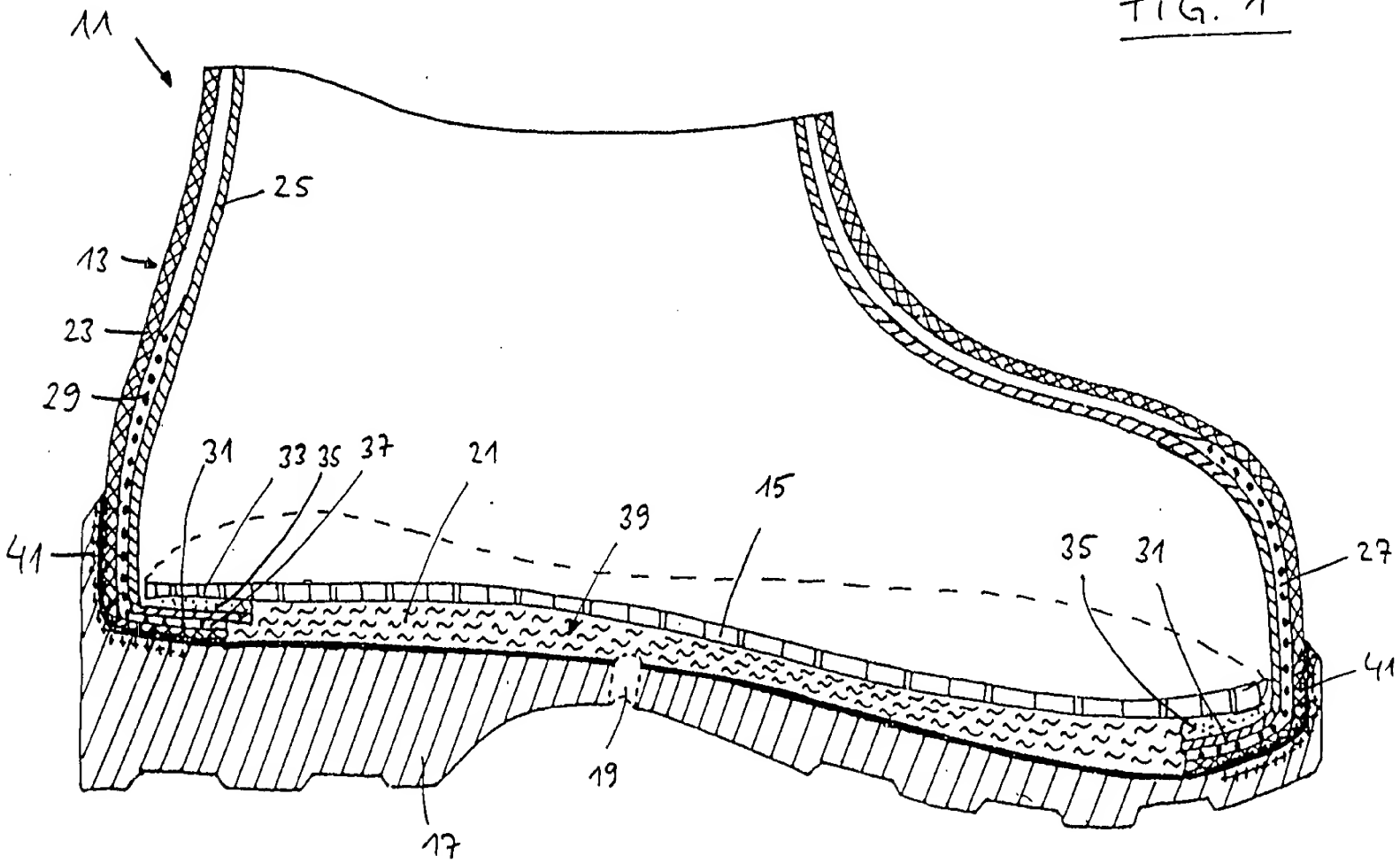

Fig. 2

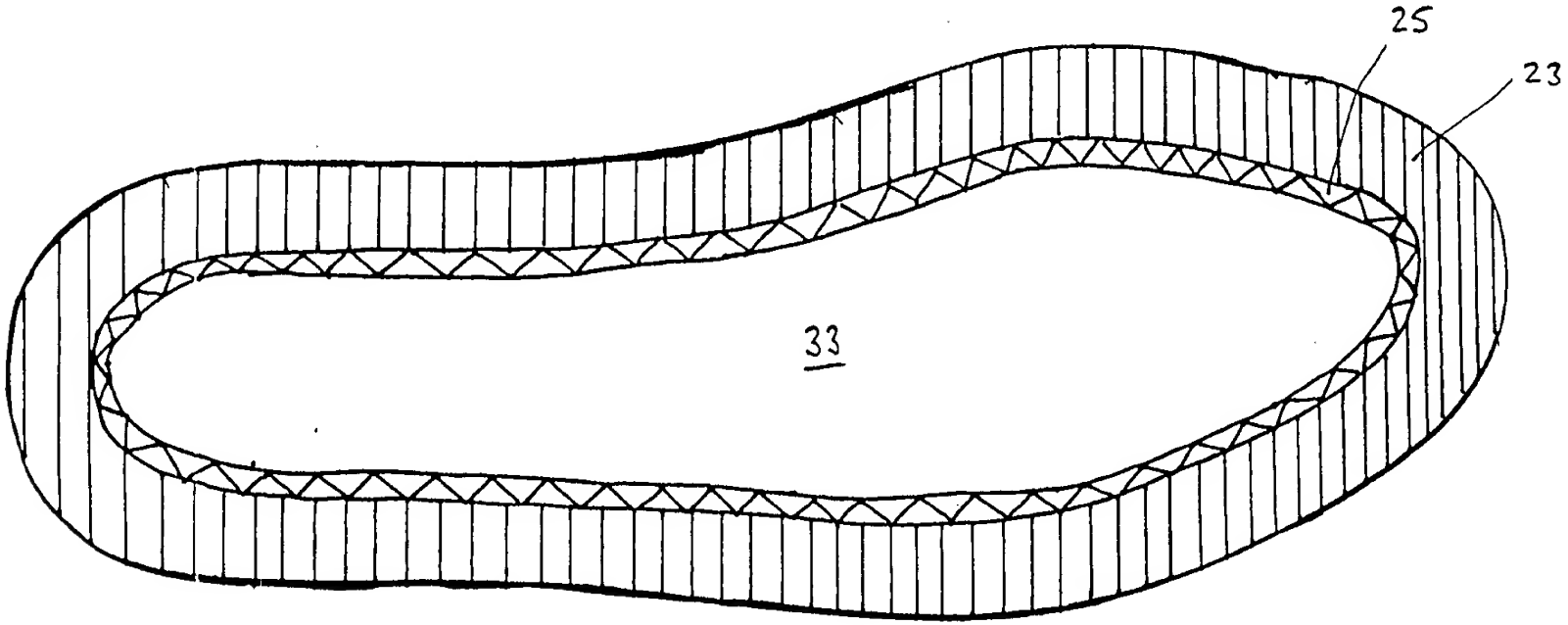

FIG. 3